

time, and independently one of the other, by Wolf and by Linnæus, and thirty years before Goethe propounded a similar notion. Moreover, it brings into prominence not only the morphological relation of shoot and flower, but one manner in which the time of production of the shoot and of the flower respectively may be varied, a subject having an immediate bearing on the question of unseasonable flowering. If, says Linnæus (*Prolepsis*, § iii.), "a shrub which has been grown in a pot, and has borne flower and fruit every year, be transferred to richer soil in a hot-house, it will produce for many years numerous leafy shoots, but no fruit. From which it may be inferred that the leaves are produced from the same source whence the flowers previously sprang, and so in turn what now tends to form leaves would, by this agency of Nature, be converted into flower if the same tree were again placed in a pot so as to confine the roots; hence gardeners desirous of obtaining a more plentiful crop of strawberries, cut the fine roots of the plants in spring before they transplant them, in the hope that they will produce more abundant flowers and fruit." Here we see the same principle laid down as that upon which gardeners act when they wish to secure flower and fruit by cutting off the supplies, and thus making the plant, to a greater degree, dependent on the elaborated reserve stored up in their tissues. This is effected by growing plants in small pots, root-pruning, transplanting, ringing, and other processes, all of which tend to diminish root-absorption, and by disturbing the balance between it and other processes, to check vegetation, and in so far to promote the formation of flower. Charles Martins relates the production on a very large scale of inflorescence on the Agave, in Algeria, as the direct consequence of the excision of the leaf-buds by a troop of French cavalry, who hacked the plants with their sabres as they passed, and thus, by preventing or checking growth in one direction, stimulated it in another. In like manner I have seen flowers produced on the "suckers" of *Ailanthus glandulosa* when the plant was quite young, on the roots of *Pyrus japonica*, and on a sucker of Agave, as the result of injury, probably in all, certainly in some, of the instances.

The frequent production of flowers out of season on newly transplanted trees is accounted for in like manner. But many trees are flowering this autumn which have not been slashed with sabres nor moved by more peaceful weapons. One such tree, a horse-chestnut, I lately (September) saw, in which one limb, and one only, was full of young leaves and flowers, while the remaining limbs were fast losing their foliage. The reason for this partial production of bloom I was not able to divine; possibly it may have had some relation to injury to a certain portion of the root-system in more or less direct connection with the particular branch, but I have no evidence to offer in support of such a guess.

In speaking previously of one modification of unseasonable flowering dependent on activity protracted beyond the customary period, it was mentioned that the flower was in such instances developed at the ends of long slender shoots formed during the course of the summer. In such cases the shoot ends in a flower-bud instead of a leaf-bud as is usually the case. The conditions are no longer favourable for the extension of the shoot, and the energy of growth is diverted to the production of flower. But in the laburnum, in many fruit-trees, such as the apple and pear, the fruits are normally borne on short thick branches called by the gardeners "spurs." These are very interesting physiologically, as possessing intermediate transitional characteristics, such as those before alluded to, between vegetation and seed-production. In form, these spurs are short and thick, with very narrow interspaces between the leaves, and they bear a cluster of buds which ultimately all develop into flowers, or in which the central and terminal one is a leaf-bud. Internally these spurs are soft and spongy, with a great prepon-

derance of cellular over fibro-vascular or woody tissue. The cells are moreover filled with starch. We have evidently here got to do with store-places, analogous to that furnished by the tuber of the potato and other formations, in which food, or matter capable of conversion into food, is stored up for future use at the growing points; in this case for the formation of fruit. Flowers are occasionally produced on these spurs out of due season: the flower-bud destined for a following season bursts into activity this year, affording an instance of a true *fleuraison anticipée*; but more often, according to my observations, when an untimely flower is produced (especially in the apple), it is from the development of a flower in the central bud of the spur, which is usually a leaf-bud as above stated. In such a case, then, we have not only an alteration in the character of the bud, but a change in the period of its expansion. A converse illustration to that just given is afforded by a case recorded by Mr. Berkeley, in which a bud of a walnut, which in the ordinary course of things should have produced a female inflorescence in the following spring, was developed in the autumn as a leafy shoot.

Renewal of growth after temporary arrest, "recrudescence" as it is sometimes called, occurs normally in the pine-apple, Eucomis, Metrosideros, and other plants. Abnormally, I have met with it in *Cytisus nigricans*, the common wallflower, *Oenothera*, and many others. It hardly differs from the first category mentioned in this note except in the fact that the new growth is the direct continuation of the old and not an entirely new lateral formation. It differs from the terminal bud of a "spur" in that the latter is normal as to position even if developed out of season, whereas in the class of cases now under consideration the activity of the growing point, which usually ceases with the development of the last flower, is exceptionally continued.

One other circumstance deserves mention, and that is the rarity with which true fruit, or at least ripe seed, is produced as a result of these untimely flowers. Sometimes, of course, ripe seed is produced; a plum is before me as I write the seed of which is as perfect, to all appearance, as that of the first crop could have been. But in the majority of the pears and apples which come under one's notice at this unseasonable period, the fruit is there (in the popular sense), but the core, which is in a botanical sense the true fruit, is absent, or, if present, the seeds it contains are usually abortive. Botanical readers will readily see the morphological reason why, and physiologists will recognise that in such cases the deviation from the ordinary course is not so great as it appears upon the surface, and the action of the "environment" is not so potent as it appears to be at first sight.

To sum up: these cases of unseasonable flowering appear to be due either to continuous growth and development, to renewal of growth after a longer or shorter period of arrest, or to the development of a flower-bud in the place of a leaf-bud. What produces these changes? To this no more precise answer can be given than has already been afforded. The absolute nature of the change, structurally and morphologically, depends upon the nature of the inducing causes, and varies accordingly; the degree of change may depend simply on the increased or prolonged intensity of action of the same causes which promote natural growth.

MAXWELL T. MASTERS

NOTES

THE Washington Prime Meridian Conference closed on November 1. Protocols were approved, which will be made the basis of an international convention, fixing Greenwich as the prime meridian.

MANCHESTER is determined to have the British Association in 1886, and its invitation will almost certainly be accepted.

THERE is no truth in the statement which is being repeated so often that Baron Nordenskjöld intends to lead an expedition into the Antarctic regions.

IN a letter from the Sagastyr Meteorological Station on the Lena, dated March 20, and appearing in the last issue of the *Izvestia*, M. Yurgens informs the Russian Geographical Society that twenty-six years ago a mammoth was discovered in the delta of the Lena, twenty-three miles from the station. Its head and tusks had already been taken away by a Russian merchant at the time of the discovery of the body, and the Yakuts of the neighbouring settlement have taken a leg, several ribs for making spoons, as also parts of its skin for straps, and fat for painting their sledges. The body is lying on the right side in the lower part of a crag of alluvial deposits thirty feet high. The interior is said to be quite safe. Dr. Bunge went to the place pointed out by the Yakuts, and undertook regular excavations for a distance of 350 feet, the expedition not being sure that the Yakuts have shown the right place: they consider it a sin to take from the earth what it does not give itself. The work is very hard, the excavations being made in a frozen mass of snow, "as hard as sugar," M. Yurgens says. While the work was at a lull, news was received of another mammoth's body discovered only six years ago on the Moloda River, left bank tributary of the Lena, joining it thirty-five miles above Siktyakh, which has remained still untouched. If the news is confirmed, M. Yurgens will make an excursion to discover it.

IN a subsequent letter, dated April 16, M. Yurgens writes that M. Eigner has made magnetic measurements to the east of the station as far as Ust-Yansk. Full measurements were made at ten places, notwithstanding frosts of -30° to -40° C. Mr. Yurgens will make the same measurements to the west of the station. Preparations are already made for the return journey. Several magnetic instruments had to be packed at the end of April and sent on sledges to Bulun. M. Eigner proposed to leave the station at the same time, while MM. Bunge and Yurgens intended to stay at Sagastyr until June 15.

THE following papers were entered to be read, *Science* states, at the Newport meeting of the National Academy of Sciences, Oct. 14 to 16:—On the columella auris of the Pelycosauria, E. D. Cope; the brain of Asellus and the eyeless form of Cecidotæa, A. S. Packard; on the theory of atomic volumes, Wolcott Gibbs; on the complex inorganic acids, Wolcott Gibbs; notice of Muybridge's experiments on the motions of animals by instantaneous photography, Fairman Rogers; notice of Grant's difference-engine, Fairman Rogers; on the thimolite of Lake Lahontan, E. S. Dana; on the Mesozoic coals of the North-West, R. Pumpelly; on the work of the Northern Trans-Continental Survey, R. Pumpelly; the grasses mechanically injurious to live-stock, William H. Brewster; on gravitation survey, C. S. Peirce; on minimum differences of sensibility, C. S. Peirce and J. Jastrow; researches on Ptolemy's star-catalogue, C. H. F. Peters; on the operations of the U.S. Geological Survey, J. W. Powell; the motion of Hyperion, Asaph Hall; remarks on the civilisation of the native peoples of America, E. B. Tylor; some results of the exploration of the deep sea beneath the Gulf Stream by the U.S. Fish Commission steamer *Albatross* during the past summer, A. E. Verrill; recent progress in explosives, H. L. Abbot; on an experimental composite photograph of the members of the Academy, R. Pumpelly; report on meridian work at Carlsruhe, W. Valentiner; on the algebra of logic, C. S. Peirce.

THE meeting of the Cambridge Philosophical Society next Monday at 3 p.m. will be marked by the number and importance of the biological papers communicated. One will be by a lady, Miss F. Eves, Lecturer at Newnham College, on some

experiments on the liver ferment. Mr. W. F. R. Weldon will contribute a paper on the supra-renal bodies, on which he has previously made valuable contributions. The remarkable recent development of the study of vegetable morphology and physiology under Dr. Vines will be further evidenced by Mr. Walter Gardiner's paper on the supposed presence of protoplasm in the intercellular spaces, and Mr. J. R. Green's, on a proteid occurring in plants. Prof. Michael Foster is the new President of the Society; Mr. Trotter, Mr. Glazebrook, and Dr. Vines are the Secretaries; and Prof. Cayley, Prof. Macalister, and Mr. Glaisher are the new Members of Council.

THE Statistical Society has issued in one handsome quarto a Catalogue of their most useful collection of books. The Catalogue has been compiled with great care, and on a simple and intelligible plan. The library is deemed to be a class library, and no classification therefore is attempted, the books being arranged in alphabetical order, with reference to size, under their authors' names or otherwise, as described in the preface. Secondly, there are no "blind entries," i.e. each entry, including cross-references, gives sufficient particulars, including size, to enable any person to recognise the book he is looking for, if there, and at the same time indicate to the attendant, without further reference to the Catalogue, where the book is to be found. Such features are a great comfort to the student.

MICHIGAN, like most other States, is going in for economic entomology. We have received a pamphlet of 31 pages on Injurious Insects, emanating from the Entomological Laboratory of the Michigan Agricultural College, in which Prof. A. J. Cook and Mr. Clarence M. Weed are the principal writers. Several of the usual American pests are noticed, and some are figured. We are sorry to say the figures are original, for although the practice of borrowing *clichés* has extended in the States to a degree that is almost nauseating, the results are usually satisfactory, and had the practice been followed in this instance it would have been to the advantage of this Michigan College. Probably for the first time in America the ubiquitous "Painted Lady" (*Vanessa cardui*) is stigmatised as "injurious"; it is accused of devouring hollyhock, centaurea, and borage. The same insect in Europe, a few years ago, was driven to extremes in order to find anything that would agree with it, and nearly caused a panic with the worshippers of "absinthe," by destroying the wormwood crop in the Canton of Neuchâtel (Switzerland). There are some very useful and suggestive statistics (by Mr. Weed) on the food relations of birds, frogs, and toads (the paper being a "Thesis for the degree of Master of Science"). The first part deals with the food of *young* birds, in which the American robin (a thrush, and not to be confounded with our redbreast) figures largely, as do also the "blue bird" and others. Lepidopterous larvæ are the main food, but apologies have to be made (especially in the case of the blue-bird) for the number of spiders destroyed. In the case of young "robins" the molluscous element is small; probably it would be equally small in this country with regard to *young* thrushes or blackbirds, their beaks not being sufficiently strong to enable them to do the shell-breaking. The statistics with regard to frogs and toads do not appear to be of importance one way or the other. Frogs and toads destroy insects (or "Arthropods" in the broad sense), but we fancy the particular food depends upon the conditions under which the individual Batrachian finds itself.

WE have much pleasure in calling attention to the issue, from the Breslau house of Eduard Trewendt, of four new numbers of that comprehensive work, the "Encyclopædia of Natural Sciences"—the 38th number of the first, and the 23rd to the 25th numbers of the second division. The 38th number of the first division brings the "Dictionary of Zoology, Anthropology, and Ethnology" as far as Gewöhnung (Habitua-

tion), and we need only refer in particular to the history of arthropology, of our knowledge of the Mollusca, Reptilia, and Amphibia, the writers of which occupy the front rank in their respective departments. The map of the "Zoological Regions," appended to Reichenow's interesting article on the "Geographical Distribution of Animals," will be much appreciated. The new numbers of the second division contain a continuation of Ladenburg's "Alphabetical Manual of Chemistry," with which might close two goodly volumes of this work. As physical chemistry has found an excellent representative in Prof. Eilhard Wiedemann, so is also industrial chemistry set forth by men of the first ability, whose contributions here will be prized by a wide circle: "Chlorine," by Prof. Heumann (with numerous woodcuts), "Chinoline," by Dr. L. Berend-Kiel, and "Cyanic Compounds," by Prof. Jacobsen. Nor must we omit mentioning the "History of Chemistry" (in No. 23), written for the "Alphabetical Manual of Chemistry" by Prof. G. Hoffmann of Kiel. The "Alphabetical Manual of Mineralogy, Geology, and Palæontology," continued with No. 24 of the second division, has now advanced to the end of the article "Krystallgestalten und Krystallographie" (Crystal Formations and Crystallography), which, along with the preceding article on "Crystals," by Prof. Kenngott, furnishes a very handsome contribution to the work in question, both articles being, moreover, very copiously illustrated. Finally, we have to announce that there will next appear a new botanical number which, among other things, will contain the beginning of a treatise on "Schleimpilze," by Dr. W. Zopf.

SOME 154 prehistoric tombs near Santa Lucia by Tolmein, (Gorizia), have been lately examined by Dr. Marchesetti, the director of the Trieste Museum. Their contents were conveyed to Trieste; the excavations will be continued at the instance of the Adriatic Natural History Society, for a period of about two years. During last year Dr. Marchesetti examined another burial-ground, viz. that of Vermo, near Mitterburg (Istria), which belongs to quite another period.

MR. T. MELLARD READE, C.E., F.G.S., in his presidential address to the Liverpool Geological Society this session, "On the Denudation of the Two Americas," showed that 150,000,000 tons of matter in solution are annually poured into the Gulf of Mexico by the River Mississippi; this, it was estimated, would reduce the time for the denudation of one foot of land over the whole basin—which time has hitherto been calculated solely from the matter in suspension—from 1 foot in 6000 years to 1 foot in 4500 years. Similar calculations were applied to the La Plata, the Amazons, and the St. Lawrence, Mr. Reade arriving at the result that an average of 100 tons per square mile per annum are removed from the whole American continent. This agrees with results he previously arrived at for Europe, from which it was inferred that the whole of the land draining into the Atlantic Ocean from America, Africa, Europe, and Asia contributes matter in solution which if reduced to rock at 2 tons to the cubic yard would equal 1 cubic mile every six years.

FOR several years the Director of Telegraphs at Haugesund (Norway), Herr A. Reitan, has been making experiments for the purpose of solving the problem whether fish seek places in the sea which are artificially illuminated. In order, however, to make experiments on a larger scale than hitherto, and if possible to demonstrate the value of such illuminations at great fisheries, he has received some specially-constructed electric lamps from Brussels, with which he will continue his experiments during the autumn.

THE Natural History Society of Rhineland and Westphalia held their autumn meeting at Bonn. Among the papers read we note those on the forest vegetation of the extreme north-

western portion of the Himalayas, by Dr. Brandis, and on the present state of the Phylloxera question in the Rhenish vineyards, by Prof. Borkau.

AT Schrems (Lower Austria) a violent shock of earthquake was felt on the night of October 8-9 at ten minutes past midnight. It was preceded by a subterranean rolling noise, lasting several minutes. The phenomenon was also observed at Zwettl and at Gmünd.

THE glaciers in the Dachstein Mountains have again diminished considerably at their lower extremities. Prof. Simony has recently taken a large number of photographs of the summit of the Hohe Dachstein, of the Gosau Glacier, and the Karls ice-field, in order to execute future measurements. The surface of the lowest layers of the Karls ice-field has sunk between 2.5 and 3.2 metres since last year, and the lower end of the Gosau Glacier has receded more than twice that amount. Since about 1849 this glacier has receded more than 600 metres.

WE have repeatedly referred to Hayek's "Grosser Handatlas der Naturgeschichte" (published by Moritz Perles, Vienna), which has now reached its completion.

THE death is announced of Prof. Eugenio Balbi, Professor of Geography at Pavia University, a son of the celebrated geographer, Adriano Balbi. Born at Florence on February 6, 1812, he died at Pavia on October 18 last.

THE Natural History Museum, established by the Committee of the International African Society at Brussels, grows in extent daily. The most recent additions are the skeletons of a chimpanzee, a gorilla, a crocodile, and a sea-cow. The Director of the Karema Station on Lake Tanganyika has forwarded a large collection of birds.

"A NORWEGIAN" writes to point out two errors in Mr. Mattieu Williams's note on the northernmost promontory in Norway. "To call the Knivskjærodden a 'low glaciated tongue of rock' is hardly correct. The ridge is a couple of hundred feet high at least. I have before me a photograph of the cape, taken last summer by Dr. Sophus Tromholt, and which will shortly be placed before the public. The elevation is very considerable. Mr. Williams further states that there are magnificent capes abounding around the North Cape; others are above 1000 feet. This is incorrect. The highest mountain on the coast of Arctic Norway is the North Cape, viz. 974 feet. A belief has for many years prevailed in Norway that Knivskjærodden jutted further into the ocean than the North Cape, but it has only been *proved* this summer."

THE additions to the Zoological Society's Gardens during the past week include two Rhesus Monkeys (*Macacus rhesus*) from India, presented respectively by Mr. Richard Armytage and Mrs. E. A. Russell; a Roseate Cockatoo (*Cacatua roseicapilla*) from Australia, presented by Miss N. Simonds; a Northern Mocking Bird (*Mimus polyglottus*) from North America, presented by Mr. Thomas G. Venables; a Grand Eclectus (*Eclectus roratus*) from Moluccas, presented by Miss Lawson; two Herring Gulls (*Larus argentatus*), British, presented by Mrs. Pigou; an Undulated Grass Parrakeet (*Melopsittacus undulatus*) from Australia, presented by Mr. F. Hale, F.Z.S.; a Water Rail (*Rallus aquaticus*), a Moorhen (*Gallinula chloropus*) from Norfolk, presented by Mr. T. E. Gunn; a Common Chameleon (*Chamæleon vulgaris*) from North Africa, presented by Mr. W. G. Brinkley; an Alligator (*Alligator mississippiensis*) from the Mississippi, presented by Mr. R. M. Middleton; a Greater White-crested Cockatoo (*Cacatua cristata*) from the Moluccas, deposited; a Black-headed Caique (*Caica melanocephala*) from Demerara, purchased; a Cape Ant Bear (*Orycteropus capensis*) from South Africa, received on approval.